SMD Operations Procedures Manual

8.1.1.20 OPERATION OF MAGCOOL 10 kA POWER SUPPLY FOR HORIZONTAL MAGNET TESTING

Text Pages 1 through 8
Attachments 1, 2

Hand Processed Changes

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8.1.1.20 Operation of MAGCOOL 10 kA Power Supply for Horizontal Magnet Testing

1 Purpose and Scope

1.1 The purpose of this Procedure is to provide step by step instruction in the start-up, operation, and shut-down of the Magcool 10 kA power supply located in Building 902. This information is provided for any person who will operate the controls of the Supply.

2 Responsibilities

2.1 The Operator will maintain a Horizontal Testing log book for the magnet under test. Entries will include notes of any irregularities encountered regarding the Supply.

2.2 Authorized Operators (Operators) of the Horizontal Test Facility will perform the procedure described here. A list of Operators is kept in a controlled location in the Horizontal Control Room (HCR) and on a tag attached to the input disconnect switches of the Magcool Supply.

3 Prerequisites

3.1 The Operator shall be instructed by the following people:

3.1.1 Cognizant Engineer for the Magcool Supply, or the CE's designee.

3.1.2 Cognizant Engineer or Cognizant Scientist for horizontal magnet testing, or the CE/CS's designee.

3.2 The operator shall be trained as an "affected employee" as defined by BNL ES&H standard 1.5.1, "Lockout/Tagout Requirements"

3.3 Safety Interlocks will have been successfully tested with results posted within 6 months as required by SMD OPM 8.1.1.9, Test of Safety Interlocks of MAGCOOL 10 kA Power Supply.

4 Precautions

4.1 The output power of this Supply is routed through the Distribution Box (Link Box) located adjacent to the Supply. Before opening up the Link Box, the Supply shall be locked and tagged and the Kirk keys used to open the Link Box.

4.2 Contact the CE for the Magcool Supply if it is necessary to operate the Supply in a non-standard manner, which is defined as a manner that deviates from the procedure described below. Failure to do this could result in injury to personnel or equipment damage.

4.3 Additional precautions are noted in section 5.0 before individual steps requiring precautions.

4.4 High currents can generate static magnetic fields near cables. Ensure magnetic field strengths have been measured or calculated and the required postings are in place as per the Static Magnetic Field SBMS Subject Area (https://sbms.bnl.gov/standard/1u/1u00t011.htm).

5 Procedure

NOTE

The Magcool Horizontal Test Power Supply is a dual 5 kA supply. The 5 kA supplies are designated "PS1" and "PS2".

5.1 Verify that the safety interlocks have been tested within the past six months.

IF the test approval has expired,

THEN stop work and immediately notify the Cognizant Engineer. Do not continue performing this procedure.

NOTE

A "Safety Interlock Test Approval" form is posted on both 5 kA Supply control panels, on the HTF Distribution Box (Link Box), and in the Horizontal Control Room (HCR). The form indicates the last test date, and the expiration date.

5.2 IF the Acceptance Test Procedure (ATP) requires a different output voltage than the current configuration provides,

THEN change the voltage taps on the power transformer by performing the following steps:

WARNING

Electrical Shock Hazard
Failure to follow proper Lock Out/Tag Out procedures could lead to Death or severe injury

5.2.1 Lock and tag the two 460V Input Disconnect Switches for the Supply in the OFF position. The Switches are located on the west wall behind the Supply. They are labeled "R16-2" and "R17-1". Keep the keys in your possession.

5.2.2 Remove the front panels (west side, nearest the wall) of PS1 and PS2.

5.2.3 Using a "Wiggy", verify that the Supplies are de-energized.

5.2.4 Using the diagram in Attachment 1, move the wires labeled "1", "2", and "3" to the desired taps of the PS1 transformer.

NOTE 1

DO NOT remove the wires labeled "L1", "L2", "L3" from tap number 5.

NOTE 2

Wires labeled "1", "2", "3" should be connected to taps on the left, middle, and right sides of the transformer to maintain proper phase.

5.2.5 Repeat for PS2. PS1 and PS2 must have the same configuration.

5.2.6 Tighten all bolts.

5.2.7 Remove all tools from inside the PS enclosures.

5.2.8 Double check work.

5.2.9 Replace covers.

5.3 Configure the Link Box, which is labeled "HTF DISTRIBUTION BOX", by performing the following steps:

5.3.1 Perform Lockout/Tagout. Lock and tag the 460V input disconnect switches for the Supply, located on the west wall behind the supplies and marked R16-2 and R17-1.

5.3.2 Remove Kirk lock keys #29 and #30 from the input disconnect switches.

5.3.3 Open the Link Box by unlocking Kirk locks RE11384 (key #29) and RE11534 (key #30).

CAUTION

Electrical Shock

Verify that the meter is operating properly by testing it on a similar voltage (same range) prior to and after checking Link Box

5.3.4 Verify system is de-energized using an appropriate low impedance voltage detector.

5.3.5 Verify that all mating surfaces are clean and free of debris.

5.3.6 Connect the load via the links of the Link Box. Refer to the appropriate Acceptance Test Procedure (ATP) for the particular type of magnet test being conducted.

5.3.7 Tighten all nuts.

WARNING

High Current/Arc Flash Hazard

Ensure all connections are secured and all tools, hardware and Foreign objects are removed prior to installing panels. Failure could result in Arc Flash and fire

5.3.8 Close the Link Box. Lock the Kirk Locks. Install and secure all cover panels.

5.3.9 Fill out a "Warning" sheet, describing the supply configuration (Attachment 2). Affix it to the outside of the Link Box.

5.4 Configure The Remote Control Rack, Which Is Located Adjacent To The Supply, By Performing The Following Steps:

5.4.1 Verify that control power is applied to the components of the Remote Control Rack.

5.4.2 Set the Regulator Card (labeled "REGULATOR CARD 2") as follows:

A. Potentiometer and rotary switch set according to chart above Card for the load magnet to be tested;

B. LOCAL/REMOTE toggle switch to REMOTE;

C. OPERATE/TEST toggle switch to OPERATE.

5.4.3 Set the Interface Card (marked "INTERFACE CARD") as follows:

A. DI0 through DI7 toggle switches positioned left.

B. A0 through A5 toggle switches positioned left.

C. HI-LO toggle switch positioned left.

D. LEV-RATE toggle switch positioned left.

E. FUN-SINGLE toggle switch positioned left.

F. MRD-CRD toggle switch positioned left.

G. Local/remote toggle switch positioned right (Remote).

CAUTION

Failure to start the control software before activating power to the Supply could cause equipment or product damage.

5.5 Start the control software in the Horizontal Control Room. Confirm that it is operational and that communication with the remote rack has been established (no bus error messages).

CAUTION

Failure to perform step 5.6 could result in equipment or product damage.

5.6 Before activating power to the Supply, verify that ALL of the following are true:

A. Magnet temperature is NOT above 4.8E K.

B. Gas-cooled lead flow is on.

C. Cooling water is flowing to the Supply.

5.7 Activate power to the Supply locally by performing the following steps:

5.7.1 Turn the LOCAL/REMOTE selector switch of PS1, located on the control panel on the outside of PS1, to LOCAL.

5.7.2 Repeat for PS2.

5.7.3 Remove locks and tags from the input disconnect switches labeled "R16-2" and "R17-1".

5.7.4 Unlock the Kirk Locks on the switches.

5.7.5 Place both switches in the ON position. Verify that the red POWER ON lights, located on the control panels of PS1 and PS2, illuminate.

5.7.6 If the ON/OFF breaker switches, located on the control panels of PS1 and PS2, are not in the ON position, then place them in the ON position.

5.7.7 Depress the black STANDBY/RESET push buttons. Verify the following:

A. No white FAULT lights are lit.

B. The amber STANDBY/READY light is illuminated.

C. The D.C. voltmeters and D.C. current meters on the Supply read zero.

5.7.8 Turn the LOCAL/REMOTE selector switches to REMOTE.

5.8 Before leaving the Supply area, perform the following steps:

5.8.1 IF the SCR switch is to be used for shut-off,

THEN set the SCR switch capacitor charge voltage to 1800Vdc.

IF NOT

THEN set the SCR switch capacitor charge voltage to zero.

5.8.2 Alert cryogenic personnel and other affected personnel that the Supply is about to be operated.

5.9 Operate the Supply from the HCR by performing the following steps:

5.9.1 Clear faults.

5.9.2 Turn Supply on.

5.9.3 Verify that warning lights on the Link Box, the Supply, the magnet under test, and inside the trench are flashing.

5.9.4 Verify that all personnel have exited the trench.

5.9.5 Operate Supply normally per instructions in the Acceptance Test Procedure for the particular test being conducted.

5.9.6 Confirm that the software is running per step 5.5.

5.10 Shut down the Supply by performing the following steps:

5.10.1 Ramp Supply to zero.

5.10.2 Issue a Power Supply OFF command via the computer. Verify that D.C. indicators show zero voltage and zero current.

5.10.3 At the Supply control panel, turn the LOCAL/REMOTE selector switch to LOCAL.

5.10.4 Place the input disconnect switches in the OFF position. Lock the Kirk Locks. Keep the keys in a controlled location when Supply is not in operation.

5.11 Complete log book. If any irregularities regarding the start-up, operation, or shut-down of the Supply occurred, then provide a detailed description in the log book.

6 Documentation

6.1 Link Box warning sheet.

6.2 Horizontal testing log book.

7 References

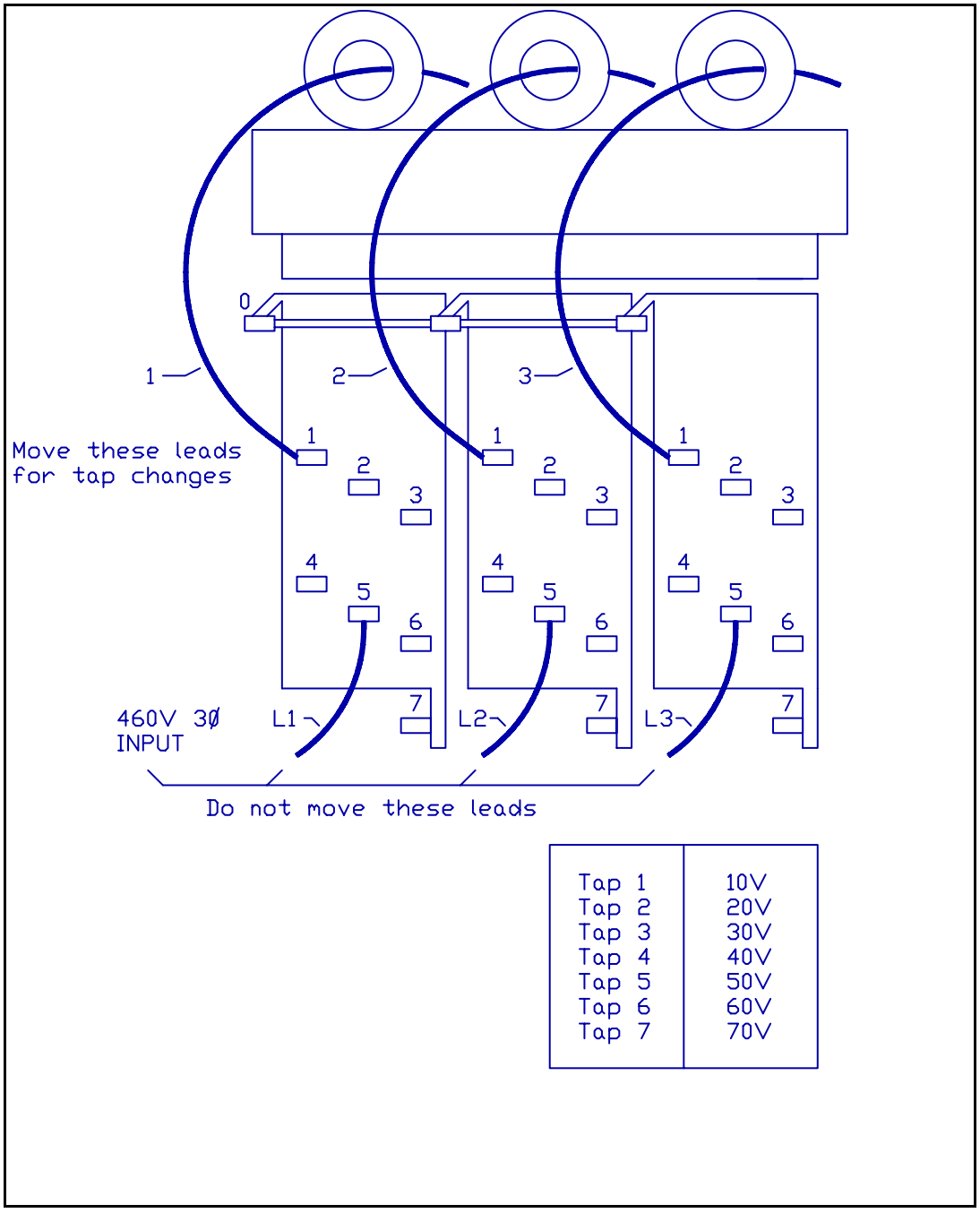
7.1 BNL ES&H Standard 1.5.1, "Lockout/Tagout Requirements."

7.2 SMD OPM 8.1.1.9, "Test of Safety Interlocks of MAGCOOL 10 kA Power Supply."

8 Attachments

1. Voltage Tap Change Diagram
2. Link Box Warning Sheet

Attachment 1 - Voltage Tap Change Diagram



Attachment 2 - Link Box Warning Sheet